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FUNCTIONAL PECULIARITIES OF THE CARDIORESPIRATORY SYSTEM OF HUMAN IN THE CONDITIONS OF ENVIRONMENTAL IMPROVEMENT

Abstract. The data of physical health showed a significant increase in the coefficient of efficiency of blood circulation (CEC) and endurance factor, reflecting the state of functional insufficiency of the cardiovascular and respiratory systems in the adult population of the city of Talgar, Almaty region. Also, an express assessment of the health level of the population surveyed showed that 28% of residents have an "average" level of physical health, 30% are "below average", and the remaining 42% have a "low" level. It is likely that the main reason for the critical level of health in most of the surveyed residents of the city of Talgar (72%) is pollution of the environment during the last 50 years by metabolites of unused pesticides on the sites of dilapidated storage facilities.

Key words: health, health scale, pesticides, cardiorespiratory system.

Introduction. In the Address of the President of the country to the people of Kazakhstan, it is pointed out that with the development of society it is necessary to take increasing efforts to improve the environment and promote public health [1, 2]. This requires a comprehensive understanding of the morph physiological organization of human life, the most optimal conditions for living in specific environmental conditions, in other words, the conditions for the formation of health of the population and its pathological deviations in connection with environmental and internal factors [3].

Currently, global pollution of surface waters and land, primarily trace elements from the group of heavy metals, radioactive waste, pesticides, the toxicity of which, when it enters the external environment, increases as a result of secondary reactions, which contributes to the accumulation of harmful and poisonous substances in land and plants, leads to a sharp decrease in the biopotential of the ecosystem and the contamination of food products by toxicants [4].

On the territory of Kazakhstan, there is a large number of unaccounted graves of non-utilized pesticides. One of these regions is the Talgar region, on the territory of which in 80-90s of the last century 64 storages of chemical plant protection products were located. At present, uncontrolled contamination of the surrounding areas with metabolites of the disintegration of pesticide substances of the chloral-organic group occurs [5]. As a result, contamination of the internal environment of the human body and animals through food, air, water, which leads to a deterioration in the health of the population living near these stores, the development of environmental risks for residence [5, 6]. The contamination of the territories of abandoned storage facilities with organ chlorine pesticides (metabolites of 2,4 DDD, 4,4 DDT, 4,4 DDE and isomers of α-HCH, β-HCH and γ-HCH), concentrations of which exceed the MPC up to 114 times, 352 650 kg of obsolete and unusable pesticides [5].

In this regard, monitoring of public health in places where serious environmental quality problems are developing is becoming particularly relevant. This is the reason for the purpose of this study: conducting a comprehensive study of the health of the population of the residents of Talgar, the district center of the Talgar district of the Almaty region, on the territory of which 64 pesticide storage facilities of organ chlorine activity were located in the past.

Object and methods of research. The health surveys involved residents of working age from 20 to 75 years old, permanently residing in the city of Talgar, Almaty region. A total of 100 people were examined.

When examining the level of physical health of the population, anthropometric methods were used, the vital capacity of the lungs, pulse, and arterial pressure before and after a fixed load, the time of restoration of the pulse after a fixed load according to the Apanasenko scale [7] were determined. On the basis of the proceedings, the local ethical committees have the permission to dissolve - Minutes No. 52 of 05.09.2017.

Research results. According to the method of G.L. Apanasenko, according to the scale of physical health, there are five levels of health: low, below average, average, above average, high, which are calculated by the parameters of body weight, vital capacity of lungs, hand dynamometry, heart rate before and after dosed load, blood pressure. The difference in health levels explains the risk of developing disabilities, heart attacks, strokes. People who have a very high and high level of health on the Apanasenko scale show more than 18 points and the risk of death is minimal. If at a very low health every third person dies in the next eight years, then at a very high level - only one hundredth. People with an "average" and "below average" level of health gain from 4 to 15 points on the scale and are already at risk, when the likelihood of developing a chronic disease is very high, the third "low" level (less than 4 points) is the zone patients, which includes people who already have chronic diseases [7].

The results of a physical health study of the population of the Talgar district of the Almaty region on the Apanasenko scale showed that 28% of the surveyed population had an "average" level, 30% of the surveyed had "below average", the rest 42% of those over 40 had a "low" level of health (table).

Express - assessment of the level of health of residents of settlements of Talgar district of Almaty region

Character / age group	20-30 years old (28 people)	30-40 years old (30 people)	40-50 years old (24 people)	50-60 years old (18 people)
Kettle Index	19,3±1,14*	19,6±1,15*	23,6±1,21	26,2±1,13
points	0	0	0	-1
Vital index VI	49,5±6,8	46,7±4,07	35,3±2,6	26,7±2,13
points	1	1	1	1
Dynamometry of the brush	54,7±2,24	55,0±2,21	55,8±2,11	53,7±1,34
points	1	1	1	1
HR*Arterial Pressure sys. /100	83,6±8,80	92,3±7,01	99,4±7,72	108,9±9,72
points	3	0	-1	-1
Time to restore the pulse, sec.	1,55±0,19*	2,15±0,16*	2,06±0,21*	2,22±0,21*
points	3	1	1	1
sum of scores	8	3	2	1
general health assessment	average	below the average	low	low

*P ≤ 0,001 – between age groups.

At the same time, the age gradation was traced - the number of people with "average" level of health included residents aged 20 to 30 who scored the maximum number of points (8 points) due to the rapid rehabilitation of the cardiorespiratory system after a fixed physical load and the Robinson index reflecting good compensatory and reserve capabilities of the young organism. Nevertheless, some young people were able to score only 4 points, which indicates a "below average" level of health. It was revealed that the decline in the level of health in all age groups is associated with the growth of the Robinson index due to an increase in blood pressure and heart rate. In addition, the recovery time of the heart rate after a fixed load increases, which reflects a decrease in the functional reserves of the cardiovascular system. It should also be noted that the functionality of the respiratory functions of the body in all residents is much lower than the physiological norm. It was found that the volume of Vital capacity (VC) in the group from 20 to

30 years is on average in the range of 2,600 ml, which is 40% less than the proper vital capacity of the lungs, which is calculated according to the conventional formula 4.9 in meters - 0.019 - by age-3.76. On the basis of the vital capacity data, the so-called vital index (VI) is calculated. It is determined by the ratio of Vital capacity (VC) (ml) to body weight (kg). In trained individuals with a developed respiratory system and the optimal mass, it is normally 55-60 ml/kg. Reduction of these indicators is a sign of respiratory failure, chronic diseases of the respiratory system and environmental ill-being.

In addition, the vast majority of residents identified a significant increase in the coefficient of efficiency of circulation (CEC). CEC reflects the transport needs of the body at a specific point in time, that is, increased activity leads to an increase in oxygen consumption and a proportional increase in CEC. At the same time, in a physically developed trained organism, the growth of the CEC is minimal, since the work of the cardiovascular system does not require significant energy inputs. According to the published data, the norm of the circulatory economy is 2,600. In our studies, the CEC values in all groups were higher than expected, exceeding by 20-22% the physiological "norm", which indicates the developing fatigue, uneconomical expenditure of energy expenditure and, as a consequence, a functional insufficiency of the cardiovascular system in the adult contingent of residents of the city of Talgar, Almaty region.

This is confirmed by the data of the endurance factor, which was calculated by the Kvass formula. At physiological norm equal to 16, in Talgar district residents this indicator varies from 18 to 20 standard units, which reflects the weakening of the functional possibilities of blood circulation and shows the predisposition of many to cardiovascular insufficiency.

In general, the analysis of the results of the rapid assessment of the level of somatic health of the population of Talgar district of Almaty oblast as ecologically polluted with unutilized pesticides of the region showed that 28% of the surveyed population has an "average" level of physical health, 30% is "below average", the remaining 40-42% - "low".

For comparison, it should be noted that in previous studies of the health of the population of the Ile-Balkhash region of the Almaty region, it was shown that approximately 30% of the surveyed population had an average level of physical health on the Apanasenko scale, the remaining inhabitants showed below-average (26%) and low level 44%), having scored less than 1 point [8]. Approximately the same state of health was revealed among the residents of the more prosperous city of Talgar in the Almaty region. But at the same time it is necessary to take into account that in the Ile-Balkhash basin there are a number of serious environmental problems related to the natural potential of the region and, consequently, to the socio-economic state. In this region, according to preliminary estimates, the desertification processes have already covered about 1/3 of the basin area. Economic activity that does not take into account natural, environmental constraints leads to pollution and destruction of the ecosystems of the basin. In the water of the Ili River, there is an increased content of sulphates, nitrites, organic compounds, pesticides and heavy metals, and the level of these substances is also increased in the eastern part of the lake. Sources of pollution are industrial enterprises, especially the Balkhash Mining and Metallurgical Combine, municipal sewage and collector-drainage water.

Nevertheless, a comparative analysis of the health data of the population living in the Ile-Balkhash basin, generally recognized as an ecologically polluted region, and the city of Talgar in the Almaty region, the geographical location and living conditions in which is much more favorable, shows that the health of the population in both regions is critical level - almost 70% of the able-bodied population, showing "below average" and "low" level of health on the Apanasenko scale, have chronic and not diagnosed cardiovascular diseases a spiral system. It is likely that the leading place in the causes of this state of health among the inhabitants of the city of Talgar is the pollution of the environment by the metabolites of unused pesticides in the places of dilapidated storages for the past 50 years.

Conclusion. Half of the population of Talgar is in critical health, on the verge of developing chronic cardiovascular and respiratory disorders, which requires a careful therapeutic examination.

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ЭКОЛОГИЯЛЫҚ ҚОЛАЙСЫЗ ЖАҒДАЙДАҒЫ АДАМДАРДЫҢ КАРДИОРЕСПИРАТОРЛЫҚ ЖҮЙЕСІНІҢ ҚЫЗМЕТТІК ЕРЕКШЕЛІКТЕРІ

Аннотация. Алматы облысы, Талғар қаласының ересек тұрғындарының соматикалық денсаулық көрсеткіштері бойынша жүрек – қантамырлар және тынысалу жүйесінің қызметтік жетіспеушілігінің күйіне әсер ететін қанайналым коэффициенті мен төзімділік коэффициенті айтарлықтай жоғарылаған. Сонымен қатар, тексеруден өткен халықтың денсаулығын экспресс-бағалау деңгейі бойынша тұрғындардың 28% - «орта» физикалық денсаулық деңгейін, 30% - «ортадан төмен», қалған 42% - «төменгі» деңгейді көрсетті. Мүмкін, оның негізгі себебі қоршаған ортаның соңғы 50 жылдан бері ластануымен, жартылайбүлінген қоймалар аймағындағы пестицид қалдықтарының дұрыс жойылмауы салдарынан Талғар қаласының тесеруден өткен тұрғындарының 72% - денсаулық көрсеткіші төменгі деңгейде.

Түйін сөздер: денсаулық, денсаулық бағанасы, пестицидтер, кардиореспираторлық жүйе.

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ФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ КАРДИОРЕСПИРАТОРНОЙ СИСТЕМЫ ЧЕЛОВЕКА В УСЛОВИЯХ ЭКОЛОГИЧЕСКОГО НЕБЛАГОПОЛУЧИЯ

Аннотация. Данные соматического здоровья показали значительное увеличение коэффициента экономичности кровообращения (КЭК) и коэффициента выносливости, отражающих состояние функциональной недостаточности сердечно-сосудистой и дыхательной систем у взрослого контингента жителей г. Талгар Алматинской области. Также экспресс-оценка уровня здоровья обследованного населения показала, что 28% жителей имеет «средний» уровень физического здоровья, 30% - «ниже среднего», остальные 42% - «низкий». Вероятно, что основной причиной критического уровня здоровья у большей части обследованных жителей г. Талгар (72%) является загрязнение окружающей среды в течение последних 50 лет метаболитами не утилизированных пестицидов, находящихся на местах полуразрушенных хранилищ.

Ключевые слова: здоровье, шкала здоровья, пестициды, кардиореспираторная система.

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